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AGRICULTURAL BIOTERRORISM: WHY IT IS A CONCERN AND WHAT WE MUST DO

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ABSTRACT

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Terrorists desiring to attack the United States could easily use biological weapons to damage the country's agricultural infrastructure. Using such methods, they could strike a blow against a key national strength, agriculture, a strength that supports the country's economy. The country needs to implement a number of changes to avoid such an attack, if possible, or be prepared to respond should an attack occur.

Drawing on current literature including journal articles, reports, and related books, reviewing current legislation and policies, this research examines the problem. The paper reviews the nature and threat of agricultural bioterrorism and considers present national capabilities, plans, and initiatives. It proposes needed actions to strengthen the country's ability to prevent, prepare for, respond to, mitigate, and remediate for biological attacks against the agricultural infrastructure.

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AGRICULTURAL BIOTERRORISM: WHY IT IS A CONCERN AND WHAT WE MUST DO

The people of the United States, in the last seven years, have become acutely aware that they are vulnerable to attack from either domestic or foreign extremist groups. Due to the open nature of the country and culture, any extremist or terrorist has the freedom to travel unimpeded anywhere in the nation.

Terrorists may employ a variety of approaches to accomplish their desired ends using assorted techniques. Timothy McVey used a combination of nitrogen fertilizer and diesel fuel to create a bomb to blow-up the Alfred P. Murrah Federal Building in Oklahoma City, OK.¹ The Al Qaeda terrorists hijacked commercial airliners to fly into the World Trade Center and the Pentagon. All of these terrorist acts employed a form of kinetic weapon against a point target.

Terrorists have many other methods to create alarm in the hearts and minds of the population. The country's leaders and emergency managers must also address the potential for terrorists to employ weapons of mass destruction (WMD). Terrorists using a chemical or nuclear device could attack point targets. Using a biological weapon containing contagious pathogens, they could attack the general population or other living organisms. Recently a great deal of effort has gone into addressing the threat of terrorists using chemical, nuclear, radiological (a conventional bomb laced with radioactive material), or biological weapons against human targets. Certainly, the country must address ways to prevent such attacks, mitigate the impact should such attacks occur, and prepare to manage the consequences.

An area receiving only moderate attention involves the potential for biological attacks against non-human targets, attacks aimed at the country's economy, by attacking the country's agricultural industrial complex. Agriculture and the general food industry remain critical to the social, economic, and political stability of the country. Unfortunately, the agricultural and related industries remain highly vulnerable to deliberate (or accidental) disruption.

In the United States, the agricultural industrial complex, which includes farming, ranching, associated allied services, and industries, employs one in six people. A major terrorist attack against the United State's agricultural industrial complex using a biological agent or toxin could have sinister ramifications, adversely influencing the economy and security of the nation. Such an attack would initially stretch local capabilities and place a severe strain on the emergency management system.

How government responds could affect the future of the country. Government and emergency managers will initially face a growing problem, possibly not knowing a terrorist attack occurred. Symptoms of a biological attack may take days or even weeks to manifest

themselves. Epidemiological studies done by agricultural specialists may be the indicator, identifying that a bioterrorist attack occurred. Rapidly identifying that an attack has occurred, identifying the biological agent used, isolating the contaminated area, and containing the source will be critical to dealing with the event. Terrorists using a biological weapon to introduce a disease to one or more agricultural product(s) could economically devastate a large segment of the nation. It could destabilize the economy, undermine political support for the country's leaders, weaken confidence in the government, and create social turmoil.²

The country depends on the strength of the agricultural industry that acts as a critical pillar for the nation's economic power. Looking at the recent outbreak of foot and mouth disease in Britain provides evidence of the negative impact of an agriculturally related disease. It cost Britain billions of dollars to handle the problem. The livestock industry in the United States is many times larger than Britain's, and the cost to the U.S. would be proportionally larger. An outbreak of this nature does not solely affect the agricultural industry. Such outbreaks have second and third order affects, adversely influencing industries dependent upon agricultural by-products, as well as, travel and tourism.³

Given the potentially adverse effects of a biological weapons attack, the country's leaders must act to prevent such attacks. Where possible, they must implement steps to mitigate the effects of an attack if it occurs; initiating the necessary programs and policy changes to improve the country's level of preparedness for crisis and consequence management. Those policies and programs must establish a means to field the tools for agent detection, to supply the tools for identifying and containing the causal agent or disease, and to provide the safety equipment for the first responders. Leaders' actions must include evaluating what programs currently exist, determining the needed changes, and constructing the policies to provide for the long-term well being of the country. Failure to act, to protect the country's agricultural industry, could jeopardize the economy and place the stability of society at risk.

DEFINING AGRICULTURAL BIOTERRORISM

Understanding agricultural bioterrorism begins with an understanding of what constitutes terrorism and a definition of the agricultural industrial complex or agribusiness. The United States Department of Justice: Federal Bureau of Investigation defines *terrorism* as, "the unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or segment thereof, in the furtherance of political or social objectives."⁴

Dr. Henry Parker, National Program Leader for Aquaculture at the United States Department of Agriculture's Agricultural Research Service, using a composite definition for

terrorism, describes it as “a hostile, covert act committed by any inimical interest against an individual, interest, or group for political, economic, or social gain that occurs outside the framework of a formally declared war.”⁵ W. Seth Carus, from the Center for Naval Analyses and visiting fellow at the National Defense University, in his testimony before Congress, defined *biological terrorism* as, “the use of biological agents to further the political objectives of the perpetrators.”⁶

Webster’s Dictionary defines *agricultural* as, “the art and science of cultivating the soil, producing crops, raising livestock, forestry, fisheries, and the associated preparation of these products for man’s use, and their disposal, or marketing.”⁷ Webster further defines *agribusiness* as “a combination of the producing operations of a farm, the manufacture and distribution of farm equipment and supplies, and the processing, storage, and distribution of farm commodities.”⁸

Dr. Peter Chalk, Policy Analyst, RAND Washington Office, defines *agricultural bioterrorism* as “the deliberate introduction of a biological agent or bio-toxin, either against livestock or into the food chain, for purposes of undermining stability and/or generating fear. Depending on the disease agent or vector chosen, it is a tactic that can be used either to generate mass socio-economic disruption or as a form of direct human aggression.”⁹ Thus, combining the dictionary definition of agriculture with Chalk’s definition, *agricultural bioterrorism* may be defined as: an act in which terrorists attack livestock, crops, orchards, forests, fisheries, food preparation or distribution centers or food storage locations (food stored for either human or animal consumption) using biological agents or toxins to attempt to further their political, economic, or social objectives.

THREAT TO AGRIBUSINESS

Why should the country be concerned about the agricultural industrial complex? The answer resides in the significance agriculture plays in the country. Agriculture is the primary source of food and clothing products and it contributes many raw materials for use by other industries. The economy depends heavily on a stable agricultural industry. The United States Department of Agriculture’s Economic Research Service (USDA-ERS) measured the importance of agriculture by estimating the supporting economic activity required to produce farm commodities and move them to goods ready for consumers. They included the activity that produces farm inputs, farm production, as well as, the assembling, processing, and distributing of raw farm products for domestic and foreign consumers. USDA-ERA found that the food and fiber system (FFS) is important to all states and nationally, accounts for 17.8

percent of total employment.¹⁰ The agricultural industry employs one in every six people employed in the country.¹¹ The food industry alone makes up nearly 10 percent of the Gross National Product.¹²

The United States currently stands as the strongest “superpower” in the world. A strong economy, the will of the people, and their belief in their government combine to form a strong base for this power. Attacking the World Trade Towers and the Pentagon on September 11, 2001, the Al Qaeda terrorist group killed several thousand people and cost the country billions of dollars, but they did not succeed in doing any significant and permanent damage to the country. If anything, the attacks galvanized the will of the people and had little lasting impact on the economy. The country has perceived the President's response to the attack as appropriate, which has gained him high approval ratings. However, if a terrorist group could attack a pillar of the economy affecting a large segment of the nation, causing high unemployment or damaging the food supply, or both, that terrorist group could potentially damage the country's financial system, undermine the will of the people, and weaken support for their leaders and government. Dr. Parker states, “Even the threat of attack could jeopardize consumer confidence, disrupt commodity markets, and wreak economic havoc.”¹³

Dr. Chalk in his testimony before the Senate Subcommittee on Oversight of Government Management, Restructuring, and the District of Columbia in October 2001, suggested three vital effects could result from a major attack against agriculture or the food chain or both: mass economic destabilization, loss of political support and confidence in the government, and social instability.

He postulates that economic destabilization would result in three levels of costs:

- Direct economic losses resulting from containment measures and the destruction of disease-ridden livestock,
- Indirect costs accrued from compensation costs paid to farmers for the destruction of agricultural commodities and losses suffered by both directly and indirectly related industries, and
- International costs in the form of protective trade embargoes imposed by major external trading partners.

Dr. Chalk indicates an undermining of the people's confidence in government and their political support would result from an attack against agriculture. “Releasing contagious agents and contaminants against livestock or introducing them into the food chain would undoubtedly cause people to lose confidence in the safety of the food supply and could lead to questions over the effectiveness of existing contingency planning against WMD in general.” He feels mass eradication and disposal are likely to be particularly controversial. Containing a major

disease outbreak would necessitate the slaughter of thousands of animals. Euthanizing large numbers of animals would likely generate widespread opposition from farmers, animal rights groups, and the public.

Dr. Chalk believes the third cost resulting from an attack against agriculture would be social instability. He suggests, “bioterrorist assaults against agriculture and/or the food chain have the potential to create mass panic, particularly if the catastrophe had a direct public health impact. The outbreak of a contagious zoonotic disease or a major food contamination scare would be most significant in this regard, especially in the event human deaths actually occurred.”¹⁴

If a terrorist group desired to attack a critical U.S. strength, an attack on the nation’s agricultural industrial base would satisfy that objective.¹⁵ If they could carry out simultaneous or near simultaneous attacks using biological agents that were highly infectious, easily dispersed, especially contagious, resistant to environmental degradation, and remaining infectious for long periods they could successfully execute such an attack.

Would such an attack be as costly to the country as asserted? Dr. Parker suggests, “Financial losses would accrue from a number of interrelated consequences, including:

- Direct losses of agricultural commodities to diseases,
- Costs of diagnosis and surveillance,
- Required destruction of contaminated crops or animals or both to contain the disease,
- Costs of disposal of mortalities and carcasses,
- Damage to consumer and public confidence,
- Need for long-term quarantine of infected areas,
- Losses due to export and trade restrictions, and
- Disruption of commodity markets.”¹⁶

Parker did not list the second and third order affects. Such an attack, for example, could reduce tourist trade and travel for many sections of the country, or adversely affect the health care system by reducing the number of people eligible to give blood. If the terrorists attacked with a zoonotic disease, it could transfer to the human population and require significant efforts to control the condition in the human population. At a minimum, anyone exposed or in the contaminated area could not contribute to the human blood supply used for transfusions.¹⁷ Thus, any widespread agricultural bioterrorist attack has the potential to affect more than just the agricultural industrial complex and would have severely unfavorable impacts throughout the nation and the world.

TERRORIST MOTIVATIONS

What motivates terrorists to attack the United States? Their motivations may vary across a large spectrum from religious fundamentalism to extreme environmentalism. In order to understand how and why a person or group would commit such an act, leaders must:

- Recognize them as a person or group with strong hostile beliefs willing to commit extremist acts to further their cause.
- The person or group will plan and prepare for their action; it will not be a spontaneous, unplanned act.
- The person or group may want to do more than gain notoriety but they may want to attack the very foundations of the country.

Given a strong enough hatred, a well-developed plan, and the ability to acquire the means, a terrorist group could attack or damage one or more of the country's strengths. Al Qaeda demonstrated its hatred, planning ability, and capacity to acquire the means when they attacked the World Trade Center and the Pentagon. Timothy McVey, a domestic extremist, demonstrated a desire to do harm to the Federal Government when he developed his plan and used readily available materials to attack the Murrah Federal Government Building in Oklahoma City. Thus, there are terrorists and extremists who hate the United States enough that they want to attack the government, the country, the people, or their values and culture.

NATIONAL STRENGTHS – CENTERS OF GRAVITY

Why would terrorists want to attack a U.S. national strength or center of gravity? If we look to Carl von Clausewitz's work On War, one of his most important concepts was the *center of gravity*.¹⁸ Applied at the strategic level the center of gravity would be the enemy's most important source of strength. According to Clausewitz, the center of gravity to attack would have to be consistent with the character of the situation and appropriate to the political purposes of the war.¹⁹ U.S. Joint doctrine states campaign planners must, properly identify the adversaries strategic centers of gravity, i.e., the sources of strength, power, and resistance. Campaign planners must first understand both the sources of the adversary's strength and their key points of vulnerability. Once the planner understands the adversary's critical strengths and vulnerabilities (those components that are vulnerable to neutralization, interdiction, or attack) they may develop a plan to attack those critical vulnerabilities in a manner to achieve decisive or significant results, disproportionate to the military resources applied.²⁰ Thus, it would be to the advantage of a terrorist if they could attack one center of gravity, a single vulnerable area, and simultaneously undermine more than a single strength.

As viewed by a disaffected person or group they would view the United States as having many sources of strength, numerous centers of gravity. Having a republican form of government based on democracy is a strength that has brought the United States to the center of world influence and certainly has made it a hegemonic power in the Western Hemisphere, if not the whole world. Additionally, the United State's economy tops all other countries in the world. The U.S. Gross Domestic Product (GDP) exceeds the combined sum of the next four largest economies' GDPs.²¹ Thus, one of the key components of the U.S.'s strength, one of its centers of gravity, is its economic strength.

The U.S. economy's strength comes from its robust and diverse base. A variety of industries and businesses combine to form the economic base for the U.S. All the following enterprises combine to form the complex and integrated financial system of the U.S. economy: farming, ranching, agribusiness, forestry, and fisheries; mining; manufacturing; transportation, communications, and utilities; wholesale and retail trade; finance, insurance, and real estate; services, information management and technology; and, federal, state, and local governments.²² Among all the diverse elements of the U.S.'s economic system farming, ranching, forestry, and fisheries have a unique quality, which distinguishes them from the other segments of the system. The agricultural industry (made-up of farming, ranching, forestry, and fisheries) grows, processes, or markets living organisms. The cultivation of living organisms constitutes the basis for farming, forestry, and fisheries. Conversely, the other components of the economy largely base their operations or activities on inert, non-living resources.

The agricultural industry cultivates living organisms, living organisms are subject to disease, and poisoning. Consequently, the agricultural industry is vulnerable to biological attack. Using an effective biological weapon would allow terrorists to attack on a broader scale than when using conventional, non-nuclear kinetic weapons or a conventional bomb. Conventional bombs are most effective against a single target with limited secondary effects.

BIOLOGICAL WEAPONS SUBJECT TO WEAPONIZATION

Dr. Kathleen Bailey, National Institute for Public Policy and author of the textbook, *Doomsday Weapons in the Hands of Many*, describes the nature of biological agents and toxins subject to weaponization as follows:

- *Biological agents* are disease causing organisms and materials –whether viral, bacteriological, rickettsiae, fungal, or protein—that can cause damage to or death of humans, other animals, or plants. Toxins are the harmful chemicals that can be produced by bacterial, marine organisms, fungi, plants, and animals. Biological and toxin weapons (BTW) are devices, such as aerosol sprayers or munitions, designed to deliver biological agents to a target population.

- *Bacteria* are single-cell organisms. An example of a bacterial agent is *Bacillus anthracis*, a hardy bacterium that causes the highly lethal disease pulmonary anthrax.
- *Rickettsiae* are bacteria that can only reproduce inside of animal cells. A well-known example is *Coxiella burnetii*, which causes Q fever.
- *Viruses* are intracellular parasites consisting of a strand of genetic material (DNA or RNA) surrounded by a protective coat that facilitates transmission from one cell to another. An example of a virus that could be used as a weapon is the *Variola virus*, the virus that causes smallpox.
- *Fungus* are any of a major group (Fungi) of saprophytic and parasitic lower plants that lack chlorophyll and include molds, rusts, mildews, smuts, mushrooms, and yeasts. Fungal agents ordinarily do not cause disease in healthy humans or animals, although they can be devastating to those with deficient immune systems. Rather fungi that have been developed as weapons have predominantly been those that cause diseases of plants.
- Some *Proteins* can be used as weapons. Most bacterial toxins are large proteins that either affect the nervous system (neurotoxins) or damage membranes. An example of a neurotoxin is the toxin secreted by *Clostridium botulinum*, the most poisonous substance known. A fatal dose of botulinum toxin A by injection or inhalation is about one nanogram (one billionth of a gram) per kilogram. Staphylococcal enterotoxins (an incapacitant) and botulinum toxins are 1000 to 10,000 fold more toxic than classical nerve agents.
- *Low-molecular-weight* toxins may be either organic molecules or peptides. Examples of low-molecular-weight toxins are saxitoxin, a neurotoxin found in some shellfish, and trichothecene mycotoxins, which are produced by fungi. Some low-molecular-weight toxins can be produced by chemical synthesis.²³

Terrorists using a biological agent that is highly infectious, especially contagious, and easily dispersed could strike a small number of targets, possibly only one target, and the disease could potentially spread on its own. Therefore, an attack could grow and spread without the terrorist being present and the disease would spread until contained by external intervention or environmental factors stopped the pathogens movement. Every state in the U.S. has some form of agricultural activity.²⁴ Since agriculture involves either plant or animal production or both, a terrorist could select nearly any location in the U.S. and find countless targets.

The Organization Internationale des Epizooties (OIE), the international standard setting body for animal health and international trade, categorizes animal diseases in two classes.

Table 1 lists the diseases the OIE considers as reportable.²⁵

List A Diseases	
The following are transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders. The introduction and spread of these diseases have serious socio-economic or public health consequences and are of major importance in the international trade of animals and animal products.	
<ul style="list-style-type: none"> • <u>Foot and Mouth Disease</u> • <u>Vesicular Stomatitis</u> 	<ul style="list-style-type: none"> • <u>Bluetongue</u> • <u>Sheep Pox and Goat Pox</u>

<ul style="list-style-type: none"> • <u>Swine Vesicular Disease</u> • <u>Rinderpest</u> • <u>Peste des Petits Ruminants</u> • <u>Contagious Bovine Pleuropneumonia</u> • <u>Lumpy Skin Disease</u> • <u>Rift Valley fever</u> 	<ul style="list-style-type: none"> • <u>African Horse Sickness</u> • <u>African Swine Fever</u> • <u>Classical Swine Fever</u> • <u>Highly Pathogenic Avian Influenza</u> • <u>Newcastle Disease</u>
List B Diseases	
The following are transmissible diseases considered to be of socio-economic and/or public health importance within countries and are significant in the international trade of animals and animal products.	
Multiple species diseases	Cattle diseases
<ul style="list-style-type: none"> • <u>Anthrax</u> • <u>Aujeszky's disease</u> • <u>Echinococcosis/Hydatidosis</u> • <u>Heartwater</u> • <u>Leptospirosis</u> • <u>Q Fever</u> • <u>Rabies</u> • <u>Paratuberculosis</u> • <u>New World screwworm (<i>Cochliomyia hominivorax</i>)</u> • <u>Old World screwworm (<i>Chrysomya bezziana</i>)</u> 	<ul style="list-style-type: none"> • <u>Bovine anaplasmosis</u> • <u>Bovine babesiosis</u> • <u>Bovine brucellosis</u> • <u>Bovine genital campylobacteriosis</u> • <u>Bovine tuberculosis</u> • <u>Bovine cysticercosis</u> • <u>Dermatophilosis</u> • <u>Enzootic bovine leukosis</u> • <u>Haemorrhagic septicaemia</u> • <u>Infectious bovine rhinotracheitis / infectious pustular vulvovaginitis</u> • <u>Theileriosis</u> • <u>Trichomonosis</u> • <u>Trypanosomosis (tsetse-borne)</u> • <u>Malignant catarrhal fever</u> • <u>Bovine spongiform encephalopathy</u>
Sheep and goat diseases	Equine diseases
<ul style="list-style-type: none"> • <u>Ovine epididymitis (<i>Brucella ovis</i>)</u> • <u>Caprine and ovine brucellosis (excluding <i>B. ovis</i>)</u> • <u>Caprine arthritis/encephalitis</u> • <u>Contagious agalactia</u> • <u>Contagious caprine pleuropneumonia</u> • <u>Enzootic abortion of ewes (ovine chlamydiosis)</u> • <u>Ovine pulmonary adenomatosis</u> • <u>Nairobi sheep disease</u> • <u>Salmonellosis (<i>S. abortusovis</i>)</u> • <u>Scrapie</u> • <u>Maedi- visna</u> 	<ul style="list-style-type: none"> • <u>Contagious equine metritis</u> • <u>Dourine</u> • <u>Epizootic lymphangitis</u> • <u>Equine encephalomyelitis (Eastern and Western)</u> • <u>Equine infectious anaemia</u> • <u>Equine influenza</u> • <u>Equine piroplasmosis</u> • <u>Equine rhinopneumonitis</u> • <u>Glanders</u> • <u>Horse pox</u> • <u>Equine viral arteritis</u> • <u>Japanese encephalitis</u> • <u>Horse mange</u> • <u>Surra (<i>Trypanosoma evansi</i>)</u> • <u>Venezuelan equine encephalomyelitis</u>
Swine diseases	Avian diseases
<ul style="list-style-type: none"> • <u>Atrophic rhinitis of swine</u> 	<ul style="list-style-type: none"> • <u>Avian infectious bronchitis</u>

<ul style="list-style-type: none"> • <u>Porcine cysticercosis</u> • <u>Porcine brucellosis</u> • <u>Transmissible gastroenteritis</u> • <u>Trichinellosis</u> • <u>Enterovirus encephalomyelitis</u> • <u>Porcine reproductive and respiratory syndrome</u> 	<ul style="list-style-type: none"> • <u>Avian infectious laryngotracheitis</u> • <u>Avian tuberculosis</u> • <u>Duck virus hepatitis</u> • <u>Duck virus enteritis</u> • <u>Fowl cholera</u> • <u>Fowl pox</u> • <u>Fowl typhoid</u> • <u>Infectious bursal disease (Gumboro disease)</u> • <u>Marek's disease</u> • <u>Avian mycoplasmosis (<i>M. gallisepticum</i>)</u> • <u>Avian chlamydiosis</u> • <u>Pullorum disease</u>
<u>Lagomorph diseases</u>	<u>Fish diseases</u>
<ul style="list-style-type: none"> • <u>Myxomatosis</u> • <u>Tularemia</u> • <u>Rabbit haemorrhagic disease</u> 	<ul style="list-style-type: none"> • <u>Viral haemorrhagic septicaemia</u> • <u>Spring viraemia of carp</u> • <u>Infectious haematopoietic necrosis</u> • <u>Epizootic haematopoietic necrosis</u> • <u><i>Oncorhynchus masou</i> virus disease</u>
<u>Mollusc diseases</u>	<u>Crustacean diseases</u>
<ul style="list-style-type: none"> • <u>Bonamiosis</u> • <u>Haplosporidiosis (<i>H. nelsoni</i> or <i>H. costale</i>)</u> • <u>Perkinsosis</u> • <u>Marteiliosis</u> • <u>Mikrocytosis (<i>Mikrocytos mackini</i>)</u> 	<ul style="list-style-type: none"> • <u>Taura syndrome</u> • <u>White spot disease</u> • <u>Yellowhead disease</u>
<u>Bee diseases</u>	<u>Other List B diseases</u>
<ul style="list-style-type: none"> • <u>Acariosis of bees</u> • <u>American foulbrood</u> • <u>European foulbrood</u> • <u>Nosemosis of bees</u> • <u>Varroosis</u> 	<ul style="list-style-type: none"> • <u>Leishmaniosis</u>

TABLE 1. ORGANIZATION INTERNATIONALE DES EPIZOOTIES DISEASE LIST

As in animals, crop diseases require a disease causing pathogen, usually a bacteria, virus, fungus, or parasite.²⁶ The American Phytopathological Society (APS), “a non-profit, professional, scientific organization dedicated to the study and control of plant diseases”, lists common plant diseases by plant.²⁷

Intelligence sources indicate states or individuals have successfully weaponized a number of animal and plant pathogens. Table 2 lists the pathogens that have been or have the potential to be weaponized.²⁸

Pathogens Weaponized or Pursued for Weaponization Potential	Pathogens with Weaponization Potential
Animal Pathogens	
<ul style="list-style-type: none"> • African swine fever* • Anthrax • Foot and mouth disease* • Hog cholera/classical swine fever* • Ornithosis/Psittacosis • Rinderpest* • Trypanosomiasis • Poxvirus <p>*Office Internationale des Epizooties List A Diseases</p>	<ul style="list-style-type: none"> • African horse sickness* • Avian influenza* • Bluetongue* • Bovine spongiform encephalopathy* • Contagious bovine pleuropneumonia* • Lumpy skin disease* • Newcastle disease* • Paratuberculosis/Johne's disease • Peste des petits ruminants* • Pseudo rabies virus • Rift valley fever* • Sheep and goat pox* • Swine vesicular disease* • Vesicular stomatitis*
Plant Pathogens	
<ul style="list-style-type: none"> • Rice blast (<i>Magnaporthe grisea</i>) • Wheat stem rust (<i>Puccinia graminis</i>) • Wheat smut (<i>Fusarium graminearum</i>) 	<p>Wheat Pathogens</p> <ul style="list-style-type: none"> • Wheat dwarf geminivirus • Barley yellow dwarf virus • Pseudomonas fascovaginaei • Clavibacter tritic <p>Corn Pathogens</p> <ul style="list-style-type: none"> • Barley yellow dwarf virus • Pseudomonas fascovaginaei • Brown strip mildew • Philippine downy mildew • Java downy mildew <p>Soybeans</p> <ul style="list-style-type: none"> • Soybean rust • Soybean dwarf virus • Red leaf blotch <p>Cotton</p> <ul style="list-style-type: none"> • Fusarium oxysporum f. sp. Vasinfectum (Australian) • Xanthomonas campestris pv. • Maloacearium (Africa) • Geminivirus

TABLE 2. ANIMAL AND PLANT PATHOGENS WITH POTENTIAL BIOWEAPONS APPLICATIONS

PREPAREDNESS, THE COUNTRY'S EFFORTS TO DATE

Fortunately, for more than a decade, the leadership of the U.S. has recognized the need to improve organization of the country's efforts to prevent or respond to either natural or

manmade disasters. None of the Executive Orders, Presidential Directives, or Congressional Acts has addressed the need to protect the agribusiness industry from terrorists, a feature common to each of these government initiatives.

The following information illustrates some of the efforts to prepare for a disaster, either natural or manmade. In November 1988, Congress passed the Robert T. Stafford Disaster Relief and Emergency Assistance Act to provide an orderly and continuing means of assistance by the Federal Government to state and local governments in carrying out their responsibilities to alleviate the suffering and damage resulting from such disasters. The Stafford Act:

- Revised and broadened the scope of existing disaster relief programs;
- Encouraged the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by the states and by local governments;
- Achieved greater coordination and responsiveness of disaster preparedness and relief programs;
- Encouraged individuals, states, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance;
- Encouraged hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and
- Provided for Federal assistance programs for both public and private losses sustained in disasters.²⁹

Also in 1988, President Ronald Reagan signed Executive Order 12656, clarifying the Stafford Act and providing for the assignment of emergency preparedness responsibilities.³⁰ His order set forth a National Security Emergency Preparedness Policy. Deriving from these laws and directive, Federal Emergency Management Agency (FEMA) published the Federal Response Plan (FRP), which established the process and structure for the delivery of Federal assistance in the event of any major disaster or emergency declared under the Stafford Act. The FRP established the process for coordinating the efforts of 27 Federal departments and agencies, including the American Red Cross, following the President signing an order declaring a major disaster or emergency. The FRP organizes the Federal response around a structure of 12 Emergency Support Functions (ESF), and directing which agency has primary responsibility in each of the 12 functional areas.³¹

President William Clinton published Presidential Decision Directive (PDD) 39 in June 1995, creating a U.S. Policy on Counterterrorism. The policy works to deter and preempt terrorist attacks, apprehend and prosecute any terrorist committing such an act, or assist other

governments to prosecute any individual who plans or performs such an attack. The policy established the Department of Justice (DOJ) as the lead agency for responding to terrorist acts. The policy gave the Federal Bureau of Investigation (FBI), as part of the DOJ, operational lead agency responsibility. The FEMA was designated lead agency for consequence management. PDD 39 defined the Federal government's policy for the Federal response to threats or acts of terrorism involving nuclear, biological, and/or chemical material and weapons of mass destruction. FEMA subsequently amended the FRP adding the Terrorism Incident Annex. PDD 39 directed the involvement of several agencies in reducing the country's vulnerability to terrorist acts. The policy directed the Secretary of State to reduce vulnerabilities of non-military U.S. Government installations abroad to improve the security and safety of all U.S. citizens abroad. It directed the Secretary of Defense to reduce the vulnerability of all U.S. military personnel and facilities. It directed the Secretary of the Treasury to reduce the country's vulnerabilities by preventing the unlawful traffic in firearms and explosives. Finally, the policy directed the Director, Central Intelligence to reduce U.S. vulnerabilities to international terrorism through its programs for foreign intelligence collection, analysis, counterintelligence, and covert actions.³²

The Federal government continued its efforts toward preparing the country for possible terrorist attacks, when President Clinton, in PDD 63, "Critical Infrastructure Protection," focused the country's efforts to prepare the nation's critical infrastructures for the possibility of a terrorist attack or attacks. The directive designated selected physical and cyber-based systems as essential to the minimum operations of the economy and the government. Table 3 lists the eight designated systems and lead agency for the plan's implementation.³³

Critical Infrastructure Protection	
Lead Agency	Sectors and Functions
1. Department of Commerce (Commerce)	Information and Communications
2. Department of Treasury (Treasury)	Banking and Finance
3. Environmental Protection Agency (EPA)	Water Supply
4. Department of Transportation (DOT)	Aviation, Highways, Mass Transit, Pipelines, Rail, and Waterborne Commerce
5. Department of Justice (DOJ)/Federal Bureau of Investigation (FBI)	Emergency Law Enforcement Services
6. Federal Emergency Management Agency (FEMA)	Emergency Fire Service, Continuity of Government Services
7. Department of Health and Human Services (DHHS)	Public Health Services (including: prevention, surveillance, laboratory services, and personal health services)
8. Department of Energy (DOE)	Electric Power,

	Oil and Gas Production and Storage
Lead Agencies for Special Functions	Special Function
DOJ/FBI	Internal Security
Central Intelligence Agency (CIA)	Foreign Intelligence
Department of State (DOS)	Foreign Affairs
Department of Defense (DOD)	National Defense

TABLE 3. CRITICAL INFRASTRUCTURE PROTECTION: LEAD AGENCIES AND THEIR RESPONSIBILITIES

Throughout the decade of the 1990s, The Federal Government implemented several other initiatives for responding to terrorist acts. In 1996, Congress passed the *Defense Against Weapons of Mass Destruction Act*, which directed the DOD to improve preparedness against acts of terrorism. This act also authorized the DHHS through the Office of Emergency Response to develop the Metropolitan Medical Response Systems (MMRS). Congress in 1996 passed the *Antiterrorism and Effective Death Penalty Act*, which authorized FEMA and the DOJ to provide training to local fire, emergency medical, public safety personnel, who would be the first responders to the scene of any terrorist act.³⁴

Following the terrorist attacks on the World Trade Center and the Pentagon, President George W. Bush issued an Executive Order establishing the Office of Homeland Security. The Office of Homeland Security's mission was to develop and coordinate the implementation of a national strategy to secure the U.S. from terrorist attacks. In November 2002, Congress passed the *Homeland Security Act of 2002* authorizing the creation of the Department of Homeland Security (DHS). The Act became effective January 1, 2003, and allows for a 12-month transition period.³⁵

Congress also passed the *Public Health Security and Bioterrorism Preparedness Response Act in May 2002*. Congress' purpose was to improve national public health preparedness. Key components of the Act include:

- Funding to improve planning and preparedness, enhance local lab capacity, train personnel, and develop new drugs and vaccines,
- Funding to expand the National Pharmaceutical Stockpile, including the smallpox vaccine supply,
- Funding for water utilities to analyze drinking water system's vulnerabilities to deliberate contamination
- It imposed new registration requirements on all possessors of the 36 biological agents and toxins most dangerous to humans and *provides for similar regulation of agents that are devastating to crops and livestock,*
- Empowerment of the Food and Drug Administration (FDA) *to more thoroughly inspect suspicious foods, require advance note of food*

imports, and improve investigative methods to locate sources of food contamination, and

- Funding for the FDA and the U.S. Department of Agriculture (USDA) *to hire more food-import inspectors, improve contaminated foods detection, and to implement measures to protect crops and livestock.*

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The Office of Homeland Security as it transitions to the DHS continues to vigorously pursue and support the process of preparing the country for possible terrorist attacks. With funding provided by Congress; Federal, state, and local governments, law enforcement agencies, and emergency responders continue to improve their response plans, training, communications systems, health care programs, and laboratories. Table 4 lists some of the terrorism preparedness activities taking place in selected Federal agencies.³⁷

Agency	Key Activities
US Department of Agriculture (USDA)	USDA personnel conduct cargo and product inspections of travelers and baggage at borders to prevent the entry of animal or plant pests and diseases. Food Safety Inspection Service (FSIS) inspects farms and other production and processing sites to assure food safety. USDA Office of Crisis Planning and Management is the main office involved with antiterrorism activities. USDA participates in several food borne disease surveillance systems that involve collaboration between CDC, FDA, and USDA.
Department of Defense (DOD)	Several areas of DOD are involved in bio-security, including the Defense Threat Reduction Agency (DTRA), the Defense Advance Research Projects Agency (DARPA), and the Joint Task Force of Civil Support (JTFCS). The National Guard and U.S. Army also have responsibilities for responding to crises. The U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) conducts research on potential bioterrorist agents and provides guidance on medical management issues.
Department of Health and Human Services (DHHS): Agency for Healthcare Research and Quality (AHRQ)	AHRQ funds various projects to improve preparedness. Examples: Training modules to teach health professionals how to address varied biological agents, best methods of training clinicians, and tools for assessing hospital preparedness
DHHS: Centers for Disease Control and Prevention (CDC)	The goal of CDC's bioterrorism program is to enhance public health preparedness against bioterrorism attacks. Areas of focus include surveillance, epidemiology, rapid laboratory diagnosis, emergency response, and information systems. CDC works toward its goal by: providing funding to state and selected local health departments, maintaining the National Pharmaceutical Stockpile, coordinating the Health Alert Network (HAN), and coordinating the Laboratory Response Network (LRN). CDC also participates in several food-borne disease surveillance systems that involve collaboration between CDC, FDA, and USDA.
DHHS: CDC: National Institute for Occupational Safety and Health (NIOSH)	NIOSH issues guidance documents on worker safety and safety in the workplace.
DHHS: Food and Drug Administration (FDA)	FDA conducts various programs on food safety. FDA recently published a guidance document for industry on food security. FDA also monitors the occurrence of food borne illnesses through several surveillance systems that involve collaboration between CDC, FDA, and

	USDA.
DHHS: Health Resources and Services Administration (HRSA)	HRSA has primary responsibility for promoting hospital preparedness for mass casualty events, including those caused by bioterrorism.
DHHS: National Institutes of Health (NIH)	NIH has funded research in the areas of diagnostics, clinical therapies, vaccines, and basic science through the National Institute of Allergy and Infectious Diseases (NIAID).
DHHS: Office of the Assistant Secretary for Public Health and Emergency Prepared	This office coordinates public health preparedness for terrorism acts, including bioterrorism. Includes the Office of Emergency Response (formerly the Office of Emergency Preparedness), which administers: The National Disaster Medical System (NDMS), which assures that medical resources are available for response to disasters, and work with local agencies to develop Metropolitan Medical Response Systems
Department of Justice (DOJ): Federal Bureau of Investigation (FBI)	FBI is responsible for coordinating federal domestic preparedness against weapons of mass destruction. FBI Counterterrorism Division includes National Infrastructure Protection Center (NIPC) and National Domestic Preparedness Office (NDPO).
DOJ: Office of Justice Programs (OJP)	OJP provides training for first responders through the Office of Domestic Preparedness. OJP also provides access to protective equipment for responding to an event involving weapons of mass destruction.
Department of Transportation (DOT): US Coast Guard	US Coast Guard is responsible for maintaining the safety of coastal waters, waterways, and docks.
Department of Veterans' Affairs (VA)	VA provides medical backup to DOD and DHHS as needed for medical disasters. VA provides support to DHHS for maintaining the National Pharmaceutical Stockpile.
Environmental Protection Agency (EPA)	EPA has the authority and responsibility to prepare for and respond to emergencies involving oil, hazardous substances, and certain radiological materials. EPA has required communities to develop emergency plans for release of hazardous substances through Local Emergency Planning Committees (LEPC). EPA has assisted in training first-responders to handle terrorist events. In the event of a terrorist act involving environmental contamination, EPA is responsible for assisting with environmental monitoring, decontamination efforts, and long-term site cleanup.
Federal Emergency Management Agency (FEMA)	FEMA is the lead agency for consequence management following an event involving weapons of mass destruction.
Department of Homeland Security (DHS)	Department was established in response to the September 11, 2001, terrorist attack. DHS works with executive departments and agencies, state and local governments, and private entities to ensure adequate preparedness and response against homeland terrorist attacks.

TABLE 4. BIOTERRORISM MEDICAL AND PUBLIC HEALTH PREPAREDNESS: KEY ACTIVITIES OF SELECTED FEDERAL AGENCIES

AGRICULTURAL PREPAREDNESS

U.S. leaders have realized the country is ill prepared to combat a wide spread bioterrorist attack. The country is even less prepared to deal with a bioterrorist attack directed at the agricultural industry, agribusiness, or the agricultural infrastructure. Dr. Parker sites three reasons. First, the U.S. has available an abundant, safe, and affordable food supply which has

been the situation most of the 20th Century. U.S. citizens find it unthinkable that food could be scarce, expensive, or that they could be at risk as consumers. Second, the country's economy has transitioned from an agricultural base in the 19th century, to an industrial base in the 20th century, and has more recently added services and information management to the economic base as the world enters the 21st century. Thus, agriculture has less visibility to the general population than in past generations. Finally, leaders and emergency managers have focused on the potential for a bioterrorist attack against human targets. They think in terms of human diseases when considering bioterrorism.³⁸

Some of the modest efforts regarding food and agricultural protection include the USDA transferring their Plum Island, New York Animal Disease Center to the DHS's Chemical, Biological, Radiological, and Nuclear Countermeasures program. In addition, under the border and transportation security mandate, the USDA will transfer its Animal and Plant Health Inspection Service to the DHS. The Animal and Plant Health Inspection Service conducts inspections at border and entry points, to prevent the possible entry of pests or diseases carried in by animals, or plants, or both.

Selected groups within the agricultural industry have recognized the lack of government direction; they have been preparing for the possibility of a terrorist attack against agribusiness. The United States National Animal Health Emergency Management System's (NAHEMS) steering committee has published their Strategic Plan for years 2000 through 2005. The NAHEMS's plan proposes a program to improve animal health emergency management efforts in the U.S. by the end of 2005. Members of the NAHEMS Steering Committee come from the American Veterinary Medical Association, the Animal Agriculture Coalition, the USDA Animal and Plant Health Inspection Service (APHIS), and the United States Animal Health Association.

NAHEMS established seven action guidelines to reach their overall goal for improving emergency care for animals:

- They propose improving the working relationships among Federal agencies, state agencies, the animal industries, and private practitioners in the veterinary profession. They want to improve coordination, implement standards, sponsor a forum on animal emergency health management, improve formal agreements as part of the FRP, and have the USDA work more closely with DOD, FBI, and the CIA to better prepare to respond to potential bioterrorist threats.
- The NAHEMS recommends developing national, state, and industry standards to coordinate efforts among the Federal Government, states, and industry.
- NAHEMS proposes improving research and diagnostic capabilities on foreign and emerging animal diseases. Under this guideline, they want increased funding for adequate diagnostic and research biocontainment facilities at USDA-Agricultural

Research Service (USDA-ARS) and APHIS priority research locations such as USDA-ARS's Plum Island Research Facility, New York, and the Animal Disease Research Unit at Pullman, Washington.

- NAHEMS wants to improve monitoring and surveillance systems to more quickly identify foreign and emerging disease agents. They urge the development and implementation of effective risk based inspection procedures and programs to prevent animals and animal products that carry disease from entering the U.S.
- NAHEMS recommends expanding training, education, and efforts to improve public awareness. They see a need for expanded emergency management training for a situation when emergency responders must respond to specific animal health emergencies. They propose expanding the number of Foreign Animal Disease Diagnosticians by training a wider audience to include military, state, and industry veterinarians.
- NAHEMS advocates building a national preparedness and response infrastructure. NAHEMS's recommends the building of a secure operations center with a full scientific and technical support capability. NAHEMS proposes, in combination with the operations center, building a multimedia information network capable of receiving, storing, and transmitting critical information to all participants, decision-makers, and the public.
- NAHEMS proposes the development of emergency preparedness and response contingency plans to prevent major animal disease threats or respond to any major animal disease outbreaks.³⁹

COUNTERTERRORISM STRATEGY FOR AGRICULTURE

The United States has in general relegated to the industry the preparations for a potential terrorist attack against agribusiness. The country's leaders must incorporate protection of the agricultural infrastructure into the overall counterterrorism efforts. The Federal, state, and local government leaders in partnership with private industry must develop a comprehensive, integrated strategy to address the overall threat to the country's agricultural industry. The strategy must address prevention, deterrence, preparedness, protection, response, mitigation, and recovery.

PREVENTION AND DETERRENCE

The prevention and deterrence segment of the strategy must include numerous action items with appropriate plans for implementation. The plan must include as one of its essential elements the gathering and analysis of intelligence information. The intelligence community (IC) does a laudable job in carrying out its mission. However, many of the bioterrorism preventive and deterrent actions fall within the IC's arena and the IC must expand its efforts to address this threat. The IC must improve in their ability to gather and analyze data associated with the

pathogens and toxins affecting agriculture and food safety. To accomplish this task the IC must become more knowledgeable regarding the threat for agricultural bioterrorism and its perpetrators. They need more highly trained technicians knowledgeable in the technical aspects of biology, with greater language skills, and a broader appreciation of cultural differences. Technicians need to understand motivations, with improved acumen in predicting likely behavior.

In conjunction with improvements in intelligence gathering and analysis, the country must improve on its monitoring programs. The strategic plan must address how the country can better detect and track specific pathogens and diseases internationally. The *Public Health Security and Bioterrorism Preparedness and Response Act of 2002* provided many of the tools necessary to improve the controls on dangerous biological agents and toxins domestically.⁴⁰ The Federal government, DHS, USDA, DOS, and IC, must work with the international community to monitor and track the listed agents and toxins globally.

The country's leaders must engage with those of other countries as part of an overall counter-bioterrorism strategy. International engagement must include treaties, protocols, and agreements, which contain effective monitoring and verification programs. Using its diplomatic relationships, U.S. officials must persuade those of other nations of the world to get involved in fighting this menace. The U.S. must use its informational powers to dissuade the use of biological or chemical weapons on moral grounds, swaying the world's people to oppose such weapons. The U.S. must employ its diplomatic and informational powers to involve the whole community of nations to counter the threat of bioterrorism. The U.S. leadership must adopt and enforce a policy of non-proliferation. Through its various diplomatic channels, the nation must engage with those countries friendly to its position, uniting them to form a coalition against the use of biological and chemical weapons. The U.S. should put in place a system of rewards and penalties, and then ensure the world understands its position. Using its economic power the U.S. should reward those friends and allies that comply with its policies and apply penalties to those that do not. For those countries that support or do not oppose the use of biological weapons, U.S. leaders must make it clear, they will use harsh reprisals, including military action, to prevent any transgressions. The U.S. policy should include the option for pre-emptive military strikes if credible sources indicate countries or factions are building biological weapons, or they are not complying with the non-proliferation policies. Additionally, the U.S. must include the international law enforcement community as part of its strategy for prevention and preemption. Using law enforcement to track down and bring terrorists to justice. The United States'

international engagement policy must explain the country's position that it will retaliate to any acts of terrorism leveled against U.S. interests.

PREPARING AND PROTECTING

Concurrent with prevention and deterrence must go the process of preparing and protecting the country if prevention fails. A number of actions by a variety of stakeholders will be required to improve the readiness of the country for a potential agricultural bioterrorist attack. As one of the initial steps for enhancing preparedness, the country must invest in improved research facilities. Numerous programs exist for the study of potential weapons grade pathogens; however, researchers need to do more. The following list includes the high priority counterterrorism research needs identified by the USDA-ARS.⁴¹

- Expand on-the-spot diagnostic capabilities to include plant, animal, and insect threats.
- Conduct epidemiologic mapping of microorganisms and pests to pinpoint geographical origins.
- Engineer and manufacture vaccines in the U.S. that are effective against all highly infectious disease agents of concern.
- Improve plant genetic resistance to potential introduced pathogens.
- Develop mass vaccine delivery systems for animals, poultry, and fish.
- Develop alternatives to widespread aerial chemical control of mosquitoes, midges, and other insect vectors of human, animal, and zoonotic disease.
- Conduct research to develop alternatives to Malathion and other chemicals for control of insect pests or plants.
- Conduct research to prevent and control pathogens that are potential anti-crop biological warfare weapons.
- Conduct research to identify genes that can enhance genetic resistance of major crops to pathogens that are potential biological warfare weapons.
- Develop innovative approaches to epidemic disease control.
- Conduct active research with foreign countries to clean up disease threats at the source and remove the natural sources of infectious agents and pests that terrorists or nations might easily access.
- Develop counter toxin technologies.

To accomplish some of the needed research will require improved and expanded research facilities. The studies of pathogens that confer highly contagious diseases require the use of biosafety level (BSL) 4 laboratories. The USDA currently has no BSL 4 facilities.⁴²

PLANNING

To prepare adequately for a bioterrorist attack all stakeholders must contribute to the overall planning process. Federal, state, and local governments and industry must prepare contingency plans. Such plans help focus efforts and prioritize the use of limited resources. The DHS will have responsibility for the Federal government's plans once the agency is operational. Currently, FEMA has responsibility for the FRP and its implementation.⁴³ Prior to any Presidentially declared emergency, FEMA provides guidance to states to assist with contingency plan development, they provide preparation funding, e.g. money for first responders to purchase emergency response and personal protective equipment, and they provide training assistance through their Regional offices. State contingency plans should address each of the following areas, regardless whether the outbreak occurs naturally or from a terrorist attack:⁴⁴

- Disease detection and confirmation,
- Assessment of scope of the problem and plan activation criteria,
- Course of action development,
- Threshold criteria for activation of Emergency Response Plans (local, State, and Federal), and requirement for disaster declaration,
- Plans for activating support to isolate, quarantine, treat, or destroy crops or animals,
- Decontamination regimens,
- Plans for application of prophylactics or inoculations to the non-contaminated population,
- Public notification requirements and methods,
- Recovery procedures, and
- Closure criteria.

Dr. Henry Parker suggests that strategic plans to combat agricultural bioterrorism adapt the Center for Disease Control's performance plans, "Public Health Response to Terrorism" and "Infectious Disease" to establish performance measures to be included in the plans. Items from the performance plans for inclusion in a state's agricultural bioterrorist plans include the following:

- Establishment of sentinel networks to identify early victims,

- Increased epidemiological, clinical, and laboratory capabilities of states, and major agricultural departments,
- Establishment of a national, state-based network of reference laboratories to detect bioterrorist agents and provide rapid and accurate diagnosis,
- Provide training and technology transfer programs for state-of-the-art diagnostics for use in bioterrorism,
- Establishment of bioterrorism preparedness and response planning programs in states and localities,
- Expand electronic surveillance and communications systems in major agricultural areas, and,
- Creation of a program for agriculture similar to the National Pharmaceutical Stockpile program available for rapid deployment to areas impacted by bioterrorism.⁴⁵

Emergency Management Agencies should develop plans to train affected stakeholders and periodically exercise their plans. Critical to the process for preparing and protecting the country's agricultural infrastructure involves developing strong ties with the private stakeholders in the agricultural industry. Unlike other forms of the national infrastructure, individuals, companies, and corporations own nearly the entire agricultural infrastructure. Government must form partnerships with the private sector owners and non-governmental organizations associated with the agribusiness to succeed in protecting this sector of the country.

PRIVATE INDUSTRY PREPARATION

Private industry possesses the keys to successful preparedness. The Federal, state, and local governments along with the first responders from the private sector play key roles in helping the agricultural industry prepare for disease outbreak or terrorist attacks. However, the producers and processors must take appropriate action ahead of time to lessen the adverse consequences of such an outbreak or attack. By implementing Good Agricultural Practices (GAP) along with improved farming and ranching practices, producers may be able to limit the spread of disease. Examples of GAP programs might include crop diversification or the interspersing of crop types to provide natural barriers. Ranchers may be able to spread out their grazing locations letting distance between herds act as a barrier to the spread of disease.

⁴⁶

Food processors play a vital role in protecting the country while protecting their own interests. On 20 September 2002, CBS News published an article reporting an audit the Government Accounting Office (GAO) ran on the USDA and the meat packing industry. The audit found that, "the public is at risk for illnesses from tainted meat and poultry because the

Agriculture Department is not doing enough to oversee slaughterhouses and processing plants.⁴⁷ The report also found inspectors frequently did not identify and document when the meat-processing plants failed to find contamination hazards. USDA required meatpacking plants to install hazard-detection systems based on sound science by January 2000. When CBS published their story in September 2002, USDA had only inspected one percent of the more than 5000 plants nationwide for scientific weaknesses. The industry does employ a variety of technologies and protocols to ensure food safety. They include:

- Veterinary inspection of all animals prior to slaughter to identify suspect or ill animals,
- Government and private laboratory screening for unusual levels of compounds in animal tissues,
- Use of metal detectors to identify any inadequate metal contamination,
- Carcass washes that use hot water or acid solutions to clean carcasses and destroy harmful bacteria,
- Superheated steam or water to pasteurize the outsides of carcasses, and
- Various microbiological tests to ensure bacterial destruction and prevent other contamination.⁴⁸

Given all these safeguards, meat contamination still occurs. Should terrorists manage to start a disease outbreak, there is a risk that diseased animals could slip past inspectors at the meat processing plants due to potentially inadequate hazard-detection systems and inspectors with insufficient training.

EDUCATION AND TRAINING

The DHS, USDA, and private industry must initiate a coordinated effort to improve the overall agriculturally related education system. The program should include training for plant pathologists, veterinarians, crop specialists, animal husbandry technicians, and extension agents in the use of epidemiological models and review techniques to assist in the detection, identification, diagnosis, treatment, and containment of potential bioterrorist diseases.

Emergency Planning Agencies, universities through their agricultural curriculums, and USDA Extension Service Offices should initiate training programs for agribusiness to improve their understanding of the threat and to assist them with their overall operational security and management programs. The programs should be broad based and tailored to the needs of each agricultural sector. Maintenance of adequate national training standards and common focus should reside with the DHS and USDA.

RECOVERY

Recovering from a bioterrorist attack directed at agriculture could potentially affect many sectors of the economy outside the traditionally defined areas of agriculture. The costs of recovery will be high. Therefore, to be prepared for a bioterrorist attack against agribusiness, the Federal government needs to develop a viable national agricultural insurance scheme to assist agribusiness and associated industries to recovery from such a disaster. Additionally, Emergency Management Agencies must include in their contingency plans, the steps needed to deal with any such disaster, as outlined above.⁴⁹

LEGAL ISSUES

Federal and state governments need to address several legal issues during their planning process. Addressing the issues before a crisis may avoid unnecessary friction when a disaster does occur. Any disaster involving highly contagious pathogens will likely require imposing some form of quarantine. This applies regardless of whether terrorists target humans, using a weaponized form of Smallpox or other highly contagious and lethal disease, or animals, using a weaponized form of Foot and Mouth Disease (FMD) or other OIE List A disease. Should terrorists attack using FMD, a debilitating viral disease of cloven-footed animals such as swine, cattle, and sheep, it is thought the virus can travel up to 150 miles as a wind driven aerosol from its source.⁵⁰ The USDA: ARS currently has a research project to learn more about the spread of FMD on man, materials, fomites, aerosols, and in animal products.⁵¹ Assuming the virus transfers via fomites, on humans, or in aerosol form, controlling the spread of the disease will be extremely difficult. Imposing restrictions on the movement of people and animals in the exposure area may be the only means of controlling its spread. Government authorities must address the issues of quarantine: what is the legal foundation, can quarantine be implemented, and what level of force is acceptable?⁵²

Protecting the safety of the nation and the agricultural infrastructure will require the DHS and the Immigration and Naturalization Service to reduce the number of illegal immigrants currently populating the agricultural industry. Based on a news article from the Meat Industry Internet News Service, "No one seems to have a handle on the actual percentage of illegal workers staffing the low-paying and often dangerous and dirty slaughterhouse jobs, but most experts agree it is high, likely over 50% in many packing plants."⁵³ If nearly 50% of the workers in the meat industry have entered the country illegally, then terrorists could easily enter the country using the same methods used by other illegal immigrants. Once in the country a terrorist could move about the country undetected. Government and industry must work as

partners to solve this problem. Government must enforce the current laws and industry must support this effort by reducing its dependence on illegal immigrants for its work force.

RECOMMENDATIONS

The issues associated with agricultural bioterrorism are complex and not easily solved. Unfortunately, despite the importance of agriculture to the United States and to the world, the threat of a bioterrorist attack against U.S. agriculture industry receives little attention. Recent changes, the passage of PL 107-188, *Public Health Security and Bioterrorism Preparedness and Response Act of 2002*, and the establishment of the DHS, have resulted in the issues receiving more consideration. However, government and industry need to complete additional work to incorporate the agricultural sector into the country's overall counter terrorism program. Government in cooperation with agribusiness needs to address and take action to solve the following issues:

- Government must address the legal constraints when implementing the ROE when dealing with quarantines associated with highly contagious human or animal diseases.
- Government and the agribusiness industry must invest more into research for pathogen detection, foreign animal disease identification, immunization, pathogen transmittal and containment, and the means to protect the industry.
- Government must invest more time and money in the expansion of laboratories for research, to include BSL 4 laboratories.
- Government and the agribusiness industry should invest more in the logistical support requirements associated with handling a disease outbreak. Increasing critical vaccines and pharmaceutical supplies and pre-positioning them similar to the way the CDC has pre-positioned the National Pharmaceutical Stockpile.
- Government and the agricultural industry must join to improve the education and training programs for agricultural professionals, associated business, and industry personnel. Training programs must have a greater emphasis on exotic and foreign animal disease identification and treatment, along with large-scale animal husbandry programs.⁵⁴
- Government must invest more in the IC, to improve its intelligence gathering and analysis capability for agricultural related threats.
- Government in combination with private industry should develop on-the-spot tools to diagnose plant and animal diseases. (Similar tools are being developed for human disease detection.)⁵⁵
- The Federal government must increase its diplomatic efforts and information operations worldwide to reduce the threat from all forms of

terrorist activities. Those efforts and programs must include the threats to the nation's agricultural infrastructure.

- Government and the agribusiness industry need to increase public awareness of the threats to the agricultural infrastructure. Improving the public's awareness of the threats and improving their understanding will be important in maintaining their faith in the safety of the country's food supplies in the event of a major disease outbreak.
- The Federal government should develop a viable national agricultural insurance program to compensate agribusiness members and affected industries in the event of an agricultural bioterrorist attack.⁵⁶
- The agribusiness industry must improve their bio-security, surveillance, and employee screening programs. Food processors and packing plants need to improve their security programs and screen employees to avoid hiring high-risk employees, such as terrorists emulating illegal immigrants. The INS, as part of the DHS, should improve its enforcement programs to discourage the food processing industry and packing plants from hiring illegal immigrants.
- State and local governments need to update their emergency response plans to include responding to acts of agricultural bioterrorism. Emergency response agencies should develop exercise scenarios and periodically exercise their response plans including an act of agricultural bioterrorism as one of the exercise scenarios.
- The Federal government should create incentives for farmers and ranchers to encourage them to implement Good Agricultural Practice (GAP) programs to mitigate against the affects of an agricultural bioterrorist attack(s). Agricultural colleges and USDA extension services should update GAP policies for reducing the adverse impact of a widespread disease outbreak regardless of origin.⁵⁷
- FEMA needs to amend the FRP, expanding the Terrorism Annex to include agricultural bioterrorism.⁵⁸ Additionally, Emergency Support Function (ESF) #11, Food, directs the USDA to ensure adequate food supplies are available during declared emergencies. The plan does not address how the country would respond in the event of an attack on agricultural or the country's food supplies. FEMA should update the FRP to address how the country will respond to an agricultural bioterrorist attack.⁵⁹

CONCLUSIONS

A terrorist attack using biological pathogens directed against the United States' agricultural industry could be overwhelming. The affect to the economy could be drastic with widespread adverse ramifications undermining both the economy and the people's belief in and support of the government. Developing and implementing a sound strategy for dealing with such an event is vital to the country's ability to deal with the consequences. A strategic program

coordinating and integrating the efforts of government, the agribusiness industry, critical non-governmental organizations, along with the emergency responders is essential to mitigating the consequences of such an attack. The DHS's actions as it begins, in conjunction with the USDA, will be crucial to how the country deals with current and future threats to the agricultural industry.

WORD COUNT = 9,974.

ENDNOTES

¹ W. Gene Corley, Ph.D., P.E., S.E., Security in Federal Buildings, U.S. House of Representatives subcommittee Public Buildings and Economic Development of the House Committee on Transportation & Infrastructure, (Washington,, D.C.: The American Society of Civil Engineers, 4 June 1998), [paper on-line]; available from <http://www.fas.org/irp/congress/1998_hr/h980604-corley.htm>; Internet; accessed 25 January 2003, 2.

² Peter Chalk, Ph.D., Terrorism, Infrastructure Protection, and the U.S. Food and Agricultural Sector, U.S. Senate Subcommittee on Oversight of Government Management, Restructuring, and the District of Columbia, (Washington, D.C.: Policy Analyst, RAND Washington Office, 10 October 2001), 5-8.

³ Frank J. Cilluffo, The Threat of Bioterrorism and the Spread of Infectious Diseases, .S. Senate Committee on Foreign Relations. (Washington, D.C.: Chairman, Committee on Combating Chemical, Biological, Radiological, and Nuclear Terrorism, Homeland Defense Initiative Center for Strategic and International Studies, 5 September 2001), [paper on-line]; available from <<http://www.csis.org/hill/ts010905cilluffo.htm>>; Internet; accessed 22 September 2002., 3.

⁴ U.S. Department of Justice: Federal Bureau of Investigation, "Investigative Programs: Domestic Terrorism (DT)," FBI: Memphis Office 1 February 2003 [paper on-line]; available from <<http://memphis.fbi.gov/medt.htm>>; Internet; accessed 1 February 2003,

⁵ Henry S. Parker, Ph.D., Agricultural Bioterrorism: Assessing the Threat of Biological Terrorism, McNair Papers, vol. 65 (Washington, D.C.: Institute for National Strategic Studies, National Defense University, Fort Lesley J. McNair, 2002), 2.

⁶ W. Seth Carus, Biological Terrorism, Joint Hearing of the Senate Select Committee on Intelligence and the U.S. Senate Judiciary Committee Subcommittee on Technology, Terrorism, and Government Information. (Washington, D.C: Visiting Fellow to National Defense University from the Center for Naval Analyses, 4 March 1998), [paper on-line]; available from <http://www.fas.org/irp/congress/1998_hr/s980304-carus.htm>. Internet; accessed 22 November 2002, 1.

⁷ Webster's Dictionary, Webster's Ninth New Collegiate Dictionary, Ninth New Collegiate ed. (Springfield, MA: Merriam-Webster, Inc., 1984), 65.

⁸ Ibid.

⁹ Chalk, 2.

¹⁰ Ibid., 17.

¹¹ U.S. Department of Agriculture: Economic Research Service, "Where Is Agriculture Important?," United States Department of Agriculture: Economic Research Service, Rural Conditions and Trends 2 July 2000 Volume 10, Number 2 [journal on-line]; available from <<http://www.ers.usda.gov/publications/RCAT/rcat102/RCAT102d.pdf>>; Internet; accessed 11 December 2002, 17.

¹² U.S. Department of Agriculture: Economic Research Service, "Agricultural Outlook: Statistical Indicators," United States Department of Agriculture: Economic Research Service, Agricultural Outlook January/February 2002 No. 288 [journal on-line]; available from| <<http://www.ers.usda.gov/publications/agoutlook/jan2002/ao288h.pdf>>; Internet; accessed 11 December 2002, 30-31.

¹³ Parker, x.

¹⁴ Chalk, 5-8.

¹⁵ Antulio J. Il Echevarria, Clausewitz's Center of Gravity: Changing Our Warfighting Doctrine--Again, ed. Strategic Studies Institute (Carlisle, PA: U.S. Army War College, September 2002), vi-vii.

¹⁶ Ronald E. Hurlbert, Ph.D., "Microbiology 101 Internet Text," Washington State University (March 2000 Internet Text) 1 March 2002 [publication on-line]; available from| <<http://www.slic2.wsu.edu:82/hurlbert/micro101/pages/101biologicalweapons.html>>; Internet; accessed 11 December 2002, 7.

¹⁷ Monica Revelle, "Progress in Blood Supply Safety," Department of Health and Human Services: Public Health Service Food and Drug Administration May 1995 [publication on-line]; available from| <http://www.pueblo.gsa.gov/cic_text/health/blood-ss/blood2.htm>; Internet; accessed 14 December 2002.

¹⁸ Christopher Bassford, Clausewitz in English: The Reception of Clausewitz in Britain and America 1815-1945 (New York, NY: Oxford University Press, Inc., 1994), 27.

¹⁹ Ibid.

²⁰ Joint Chiefs of Staff, Joint Doctrine for Campaign Planning (Washington, D.C.: Department of Defense, 25 January 2002), Joint Publication 5-00.1, II-6.

²¹ World Resources Institute, "Gross Domestic Product and Trade Values," World Resource Institute based on United Nations Population Division and World Bank 2001 [publication on-line]; available from <http://www.wri.org/wri/wr-00-01/pdf/ei1n_2000.pdf>; Internet; accessed 23 December 2002, 1-2.

²² Curtis Braschler and others, "Understanding Your Community's Economic Base," University of Missouri Extension Service 1999 [paper on-line]; available from| <<http://muextension.missouri.edu/xplor/commdm/dm3005.htm>>; Internet; accessed 22 December 2002, 2-3.

²³ Kathleen C. Bailey, Ph.D., "The Biological and Toxin Weapons Threat to the United States," National Institute for Public Policy October 2001 [paper on-line]; available from| <<http://www.nipp.org/Adobe/Toxin%20Weapons2.pdf>>; Internet; accessed 19 September 2002, 2-3.

²⁴ U.S. Department of Agriculture: Economic Research Service, "Where Is Agriculture Important?," 19.

²⁵ Organization International des Epizooties (OIE), "OIE Reportable Diseases," National Animal Health Emergency Management System 2 October 2000 [publication on-line]; available from| <<http://www.usaha.org/NAHEMS/oie.html>>; Internet; accessed 22 November 2002, 1-4.

²⁶ American Phytopathological Society, "Phytopathology, or Plant Pathology: The Study of Diseases of Plants," The American Phytopathological Society 2003 [paper on-line]; available from| <<http://www.apsnet.org/visitors/phytinfo.asp>>; Internet; accessed 26 January 2003,.

²⁷ American Phytopathological Society: Committee on Standardization of Common Names for Plant Diseases, "Common Names of Plant Diseases," The American Phytopathological Society 2002 [publication on-line]; available from| <<http://www.apsnet.org/online/common/toc.asp>>; Internet; accessed 24 December 2002, 1-3.

²⁸ Parker, 18.

²⁹ Stafford, Robert T., Disaster Assistance and Emergency Relief Act as Amended, U.S. Code, Vol. 42, secs. 5121-5204c, (2000); available on-line from <<http://www.fema.gov/library/stafact.shtml>>; Internet; accessed 24 November 2002, 5-7.

³⁰ Ronald Reagan, Presidential Executive Order 12656--Assignment of Emergency Preparedness Responsibilities (Washington, D.C.: The White House, 18 November 1988), [publication on-line]; available from <<http://www.fas.org/irp/offdocs/EO12656.htm>>; Internet; accessed 5 January 2003,.

³¹ Federal Emergency Management Agency, "Federal Response Plan," Federal Emergency Management Agency 23 September 2002 [publication on-line]; available from| <<http://www.fema.gov/rrr/frp/>>; Internet; accessed 23 September 2002, 6.

³² William J. Clinton, Presidential Decision Directive 39--U.S. Policy on Counterterrorism (U) (Washington, D.C.: The White House, 21 June 1995), [publication on-line]; available from <<http://www.fas.org/irp/offdocs/pdd39.htm>>; Internet; accessed 24 September 2002, 1-2.

³³ Ibid., 7-8.

³⁴ Center for Infectious Disease Research & Policy, "Bioterrorism Preparedness, Planning, and Response," Academic Health Center, University of Minnesota 26 November 2002 [publication on-line]; available from| <<http://www1.umn.edu/cidrap/content/bt/bioprep/planning/bt-prep-planning.html>>; Internet; accessed 4 December 2002, 1-2.

³⁵ Ibid., 4.

³⁶ Ibid., 2-3.

³⁷ Ibid., 4-6.

³⁸ Ibid., 29-30.

³⁹ U.S. National Animal Health Emergency Management System (NAHEMS), Strategic Plan for Years 2000 through 2005 (Richmond, VA: United States National Animal Health Association,

August 2000), [paper on-line]; available from <<http://www.usaha.org/NAHEMS/strategy.pdf>>; Internet; accessed 22 November 2002, 2-7.

⁴⁰ Public Health Security and Bioterrorism Preparedness and Response Act of 2002, PL 107-188, (2002); [publication on-line]; available from <<http://www.ncsl.org/statefed/health/PL107-188overview.pdf>>; Internet; accessed 25 January 2003, sec 212.

⁴¹ Parker, 57.

⁴² Ibid., 47-48.

⁴³ FEMA transferred to the DHS following DHS's formation 1 January 2003.

⁴⁴ State of Minnesota, Emergency Response Plan: Foot and Mouth Disease (FMD) (Minneapolis, MN: Minnesota Board of Animal Health, 15 March 2002), [publication on-line], available from <<http://www.bah.state.mn.us/Emergency%20Plan/Emergency%20Response%20Plan.htm>>. Internet; accessed 24 November 2002, 1-57.

⁴⁵ Parker, 48.

⁴⁶ Bailey, 13.

⁴⁷ John Heilprin, "GAO: Your Meat Isn't That Safe," CBS News 20 September 2002 [paper on-line]; available from <<http://www.cbsnews.com/stories/2002/09/20/health/printable522694.shtml>>; Internet; accessed 2 February 2003, 1.

⁴⁸ American Meat Institute, "Food Security in the Meat and Poultry Industry," American Meat Institute October 2002 [paper on-line]; available from <http://www.meatami.com/content/presscenter/factsheets_Infokits/FactSheetFoodSecurity.pdf>; Internet; accessed 2 February 2003, 1-2.

⁴⁹ Chalk, 11.

⁵⁰ Parker, 15.

⁵¹ U.S. Department of Agriculture: Economic Research Service, "Foot-and-Mouth Disease Biosecurity in Livestock Rearing and Dairy Processing," U.S. Department of Agriculture: Agricultural Research Service September 2001 [project synopsis on-line]; available from <http://www.nps.ars.usda.gov/projects/projects.htm?accn_no=404713>; Internet; accessed 26 December 2002,.

⁵² Jerry L. Harper, "Bioterrorism: Homeland Defense Symposium - Law Enforcement Issues in a Bio-Event," Rand 30 March 2001 [paper on-line]; available from <<http://www.rand.org/nsrd/bioterr/harper.htm>>; Internet; accessed 2 February 2003, 4.

⁵³ Meat Industry Internet News Service, "Illegal Labor Common in Meat Industry," Meat Industry Internet News Service 26 December 2001 [paper on-line]; available from] <<http://www.spcnetwork.com/mii/2001/011232.htm>>; Internet; accessed 2 February 2003, 1.

⁵⁴ Chalk, 10.

⁵⁵ Bailey, 12.

⁵⁶ Chalk, 11.

⁵⁷ Donald W. Schaffner and Kristin Jackson, "Why Improve Food Safety through Good Agricultural Practices (Gap's)?," The State University of New Jersey: Rutgers Cooperative Extension 2000 [publication on-line]; available from] <<http://www.rce.rutgers.edu/pubs/pdfs/fs146.pdf>>; Internet; accessed 26 January 2003, 1-2.

⁵⁸ Federal Emergency Management Agency, "Federal Response Plan: Terrorism Incident Annex," Federal Emergency Management Agency 7 February 1997 [publication on-line]; available from] <<http://www.fema.gov/rrr/frp/frpterr.shtml>>; Internet; accessed 23 September 2002.

⁵⁹ Federal Emergency Management Agency, "Federal Response Plan."

LIST OF ACRONYMS

AHRQ	Agency for Healthcare Research and Quality
APHIS	Animal and Plant Health Inspection Service (USDA)
APS	American Phytopathological Society
ARS	Animal Research Service (USDA)
CDC	Center for Disease Control and Prevention
CIA	Central Intelligence Agency
DARPA	Defense Advance Research Projects Agency
DHHS	Department of Health and Human Services
DHS	Department of Homeland Security
DOD	Department of Defense
DOE	Department of Energy
DOJ	Department of Justice
DOS	Department of State
DOT	Department of Transportation
DTRA	Defense Treat Reduction Agency
EPA	Environmental Protection Agency
ERS	Economic Research Service (USDA)
ESF	Emergency Support Function
FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FFS	Food and Fiber System
FMD	Foot and Mouth Disease
FRP	Federal Response Plan
FSIS	Food Safety Inspection Service
GAO	Government Accounting Office
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
HAN	Health Alert Network
HRSA	Health Resources and Services Administration
IC	Intelligence Community
JTFCS	Joint Task Force Civil Support
LEPC	Local Emergency Planning Committees
LRN	Laboratory Response Network
MMRS	Metropolitan Medical Response System
NAHEMS	National Animal Health Emergency Management System
NDMS	National Disaster Medical System
NDPO	National Domestic Preparedness Office
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NIPC	National Infrastructure Protection Center
OIE	Organization Internationale des Epizooties
OJP	Office of Justice Programs (DOJ)
PDD	Presidential Decision Directive
USAMRIID	U.S. Army Medical Research Institute of Infectious Diseases
USDA	United States Department of Agriculture
VA	Department of Veteran's Affairs
WMD	Weapons of Mass Destruction

BIBLIOGRAPHY

- Agricultural Bioterrorism Protection Act of 2002; Listing of Biological Agents and Toxins and Requirements and Procedures for Notification of Possession, 7 CFR Part 331 and 9 CFR Part 121. Interim Rules and Regulations, Federal Register: Vol. 67, No. 155. 52383-52389., (12 August 2002). Available on-line from <http://www.fas.org/sqp/news/2002/08/fr081202.html>. Internet. Accessed 16 January 2003.
- Alibek, Ken. "Biological Weapons: Past, Present, and Future." In Firepower in the Lab, Automation in the Fight against Infectious Diseases and Bioterrorism, ed. Scott P. Layne, Tony J. Beugelsdijk and C. Kumar N. Patel, 177-185. Washington, D.C.: Joseph Henry Press, 2001.
- American Meat Institute. "Food Security in the Meat and Poultry Industry." American Meat Institute, October 2002. Paper on-line. Available from http://www.meatami.com/content/presscenter/factsheets_Infokits/FactSheetFoodSecurity.pdf. Internet. Accessed 2 February 2003.
- American Phytopathological Society. "Phytopathology, or Plant Pathology: The Study of Diseases of Plants." The American Phytopathological Society, 2003. Paper on-line. Available from <http://www.apsnet.org/visitors/phytinfo.asp>. Internet. Accessed 26 January 2003.
- American Phytopathological Society: Committee on Standardization of Common Names for Plant Diseases. "Common Names of Plant Diseases." The American Phytopathological Society, 2002. Publication on-line. Available from <http://www.apsnet.org/online/common/toc.asp>. Internet. Accessed 24 December 2002.
- Bailey, Kathleen C., Ph.D. "The Biological and Toxin Weapons Threat to the United States." National Institute for Public Policy, October 2001. Paper on-line. Available from <http://www.nipp.org/Adobe/Toxin%20Weapons2.pdf>. Internet. Accessed 19 September 2002.
- Ban, Jonathan. "Agricultural Biological Warfare: An Overview." Chemical and Biological Arms Control Institute, June 2000. Paper on-line. Available from <http://www.cbaci.org>. Internet. Accessed 16 January 2003.
- Bassford, Christopher. Clausewitz in English: The Reception of Clausewitz in Britain and America 1815-1945. New York, NY: Oxford University Press, Inc., 1994.
- Block, Steven M. "Living Nightmares: Biological Threats Enabled by Molecular Biology." In The New Terror: Facing the Threat of Biological and Chemical Weapons, ed. Sidney D. Drell, Abraham D. Sofaer and George D. Wilson, 39-75. Stanford: Hoover Institution Press, Stanford University, 1999.
- Braschler, Curtis, John A. Croll, Bryan Phifer, and John A. Kuehn. "Understanding Your Community's Economic Base." University of Missouri Extension Service, 1999. Paper on-line. Available from <http://muextension.missouri.edu/xplor/commdm/dm3005.htm>. Internet. Accessed 22 December 2002.

- Buck, George, Ph.D. Preparing for Biological Terrorism. Albany, NY: Delmar, Thomson Learning, 2002.
- Bush, George W. Report of the President of the United States on the Status of Federal Critical Infrastructure Protection Activities. Washington, D.C.: The White House, January 2001. Presidential Report to Congress. Available from http://www.fas.org/irp/offdocs/pdd/CIP_2001_CongRept.pdf. Internet. Accessed 25 January 2003.
- Carter, James E. Jr. Presidential Executive Order 12127--Federal Emergency Management Agency. Washington, D.C.: The White House, 1 April 1979. Available from <http://www.fas.org/irp/offdocs/eo/eo-12127.htm>. Internet. Accessed 5 January 2003.
- _____. Presidential Executive Order 12148--Federal Emergency Management. Washington, D.C.: The White House, 15 July 1979. Available from <http://www.fas.org/irp/offdocs/EO12148.htm>. Internet. Accessed 5 January 2003.
- Carus, W. Seth, Biological Terrorism, Joint Hearing of the Senate Select Committee on Intelligence and the U.S. Senate Judiciary Committee Subcommittee on Technology, Terrorism, and Government Information. (Washington, D.C: Visiting Fellow to National Defense University from the Center for Naval Analyses, 4 March 1998), Paper on-line. Available on-line from http://www.fas.org/irp/congress/1998_hr/s980304-carus.htm. Internet. Accessed 22 November 2002.
- _____. "Biological Warfare Threats in Perspective." The Brookings Institute, April 1998. Paper on-line. Available from http://www.brook.edu/fp/events/19980427_carus.htm. Internet. Accessed 22 November 2002.
- Caruso, J.T., Bioterrorism, U.S. Senate Judiciary Subcommittee on Technology, Terrorism, and Government Information. (Washington, D.C.: Deputy Assistant Director Counterterrorism Division Federal Bureau of Investigation, 6 November 2001), Available from <http://www.fbi.gov/congress/congress01/caruso110601.htm>. Internet. Accessed 8 December 2002.
- Center for Disease Control and Prevention. "Bioterrorism." Department of Health and Human Services: Centers for Disease Control and Prevention, February 2002. Paper on-line. Available from <http://www.cdc.gov/programs/bio9.htm>. Internet. Accessed 22 November 2002.
- Center for Infectious Disease Research & Policy. "Bioterrorism Preparedness, Planning, and Response." Academic Health Center, University of Minnesota, 26 November 2002. Publication on-line. Available from <http://www1.umn.edu/cidrap/content/bt/bioprep/planning/bt-prep-planning.html>. Internet. Accessed 4 December 2002.
- Chalk, Peter, Ph.D., Terrorism, Infrastructure Protection, and the U.S. Food and Agricultural Sector, U.S. Senate Subcommittee on Oversight of Government Management, Restructuring, and the District of Columbia. (Washington, D.C.: Policy Analyst, RAND Washington Office, 10 October 2001),

- Cilluffo, Frank J., The Threat of Bioterrorism and the Spread of Infectious Diseases, .S. Senate Committee on Foreign Relations. (Washington, D.C.: Chairman, Committee on Combating Chemical, Biological, Radiological, and Nuclear Terrorism, Homeland Defense Initiative Center for Strategic and International Studies, 5 September 2001), Paper on-line. Available from <<http://www.csis.org/hill/ts010905cilluffo.htm>>. Internet. Accessed 22 September 2002.
- Clinton, William J. Presidential Decision Directive 39--U.S. Policy on Counterterrorism (U) Washington, D.C.: The White House, 21 June 1995. Publication on-line. Available from <<http://www.fas.org/irp/offdocs/pdd39.htm>>. Internet. Accessed 24 September 2002.
- _____. Presidential Decision Directive 63--Critical Infrastructure Protection. Washington, D.C.: The White House, 22 May 1998. Publication on-line. Available from <<http://www.fas.org/irp/offdocs/pdd/pdd-63.htm>>. Internet. Accessed 24 December 2002.
- Corley, W. Gene, Ph.D., P.E., S.E., Security in Federal Buildings, U.S. House of Representatives subcommittee Public Buildings and Economic Development of the House Committee on Transportation & Infrastructure. (Washington,, D.C.: The American Society of Civil Engineers, 4 June 1998). Paper on-line. Available from <http://www.fas.org/irp/congress/1998_hr/h980604-corley.htm>. Internet. Accessed 25 January 2003.
- Echevarria, Antulio J. II. Clausewitz's Center of Gravity: Changing Our Warfighting Doctrine--Again. Strategic Studies Institute. Carlisle, PA: U.S. Army War College, September 2002.
- Edwards, Sherry L. "Operation Vanguard. " Director, Legislative and Regulatory Affairs: American Meat Institute, 5 March 2000. Paper on-line. Available from <<http://www.usda.gov/oce/waob/oc2000/speeches/edwards.txt>>. Internet. Accessed 2 February 2003.
- Federal Emergency Management Agency. "Federal Response Plan." Federal Emergency Management Agency, 23 September 2002. Publication on-line. Available from <<http://www.fema.gov/rrr/frp/>>. Internet. Accessed 23 September 2002.
- _____. "Federal Response Plan: Terrorism Incident Annex." Federal Emergency Management Agency, 7 February 1997. Publication on-line. Available from <<http://www.fema.gov/rrr/frp/frpterr.shtm>>. Internet. Accessed 23 September 2002.
- Gannon, John C. "The US Intelligence Community and the Challenge of BCW." In The New Terror: Facing the Threat of Biological and Chemical Weapons, ed. Sidney D. Drell, Abraham D. Sofaer and George D. Wilson, 123-137. Stanford: Hoover Institution Press, Stanford University, 1999.
- Haass, Richard N. "Strategies for Enhanced Deterrence." In The New Terror: Facing the Threat of Biological and Chemical Weapons, ed. Sidney D. Drell, Abraham D. Sofaer and George D. Wilson, 403-414. Stanford: Hoover Institution Press, Stanford University, 1999.
- Harper, Jerry L. "Bioterrorism: Homeland Defense Symposium - Law Enforcement Issues in a Bio-Event." Rand, 30 March 2001. Paper on-line. Available from <<http://www.rand.org/nsrd/bioterr/harper.htm>>. Internet. Accessed 2 February 2003.

- Harrison, M. A., W.C. Hurst, and J.A. Harrison. "Produce Safety & Biosecurity - a Multi-State Research, Education, & Extension Project." University of Georgia: Food Science & Technology Department, September 2002. Paper on-line. Available from <<http://cris.csrees.usda.gov/cgi-bin/starfinder/16495/crisassist.txt>>. Internet. Accessed 26 December 2002.
- Heilprin, John. "GAO: Your Meat Isn't That Safe." CBS News, 20 September 2002. Paper on-line. Available from <<http://www.cbsnews.com/stories/2002/09/20/health/printable522694.shtml>>. Internet. Accessed 2 February 2003.
- Heinauer, Gerald. "Operation Vanguard (Draft)." University California Davis, 17 July 2000. Paper on-line. Available from <http://www.migration.ucdavis.edu/rmn/changingface/cf_apr2000/heinauer.htm>. Internet. Accessed 2 February 2003.
- Hugh-Jones, Martin E. "Agricultural Bioterrorism." In High-Impact Terrorism: Proceedings of a Russian-American Workshop, ed. Office for Central Europe and Eurasia Development Committee on Confronting Terrorism in Russia, Security, and Cooperation Policy and Global Affairs National Research Council; In cooperation with the Russian Academy of Sciences, 219-232. Washington, D.C.: National Academy Press, 2002. Paper on-line. Available from <<http://www.nap.edu/openbook/0309082706/html/R1.html>>. Internet. Accessed 16 January 2003.
- Hurlbert, Ronald E., Ph.D. "Microbiology 101 Internet Text." Internet Textbook. Washington State University, 1 March 2002. Publication on-line. Available from <<http://www.slic2.wsu.edu:82/hurlbert/micro101/pages/101biologicalweapons.html>>. Internet. Accessed 11 December 2002.
- Joint Chiefs of Staff. Joint Doctrine for Campaign Planning. Washington, D.C.: Department of Defense, 25 January 2002. Joint Publication 5-00.1.
- Kozaryn, Linda D. "Defending against Invisible Killers - Biological Agents." American Forces Information Service, 10 March 1999. Available from <http://www.defenselink.mil/news/Mar1999/n03101999_9903101.html>. Internet. Accessed 21 November 2002.
- Libby, Lewis. "Legal Authority for Domestic Military Role in Homeland Defense." In The New Terror: Facing the Threat of Biological and Chemical Weapons, ed. Sidney D. Drell, Abraham D. Sofaer and George D. Wilson, 305-323. Stanford: Hoover Institution Press, Stanford University, 1999.
- Loy, James M., Admiral, and Captain Robert G. Ross. "Meeting the Homeland Security Challenge: A Principled Strategy for a Balanced and Practical Response." U.S. Coast Guard: Speeches and Testimony, September 2001. Paper on-line. Available from <http://www.uscg.mil/overview/article_meeting.htm>. Internet. Accessed 22 September 2002.
- Meat Industry Internet News Service. "Illegal Labor Common in Meat Industry." Meat Industry Internet News Service, 26 December 2001. Paper on-line. Available from

<<http://www.spcnetwork.com/mii/2001/011232.htm>>. Internet. Accessed 2 February 2003.

Minnesota, State of. Emergency Response Plan: Foot and Mouth Disease (FMD). Minneapolis, MN: Minnesota Board of Animal Health, 15 March 2002. Publication on-line. Available from <<http://www.bah.state.mn.us/Emergency%20Plan/Emergency%20Response%20Plan.htm>>. Internet. Accessed 24 November 2002.

National Guard Bureau. "Weapons of Mass Destruction - Civil Support Teams (CST)." National Guard Bureau, 7 August 2002. Paper on-line. Available from <http://www.au.af.mil/au/awc/awcgate/ng/wmd_cst_factsheet.htm>. Internet. Accessed 19 November 2002.

Office of Homeland Security. National Strategy for Homeland Security. Washington, D.C.: U.S. Office of Homeland Security, July 2002.

O'Hanlon, Michael E. "Beyond Missile Defense: Countering Terrorism and Weapons of Mass Destruction: Policy Brief #86." The Brookings Institute, August 2001. Paper on-line. Available from <<http://www.brook.edu/comm/policybriefs/pb86.htm>>. Internet. Accessed 24 September 2002.

Organization International des Epizooties (OIE). "OIE Reportable Diseases." National Animal Health Emergency Management System, 2 October 2000. Publication on-line. Available from <<http://www.usaha.org/NAHEMS/oie.html>>. Internet. Accessed 22 November 2002.

Osterholm, Michael T., Ph.D., M.P.H., and John Schwartz. Living Terrors. New York, NY: Delacorte Press a division of Random House, Inc., 2000.

Parachini, John, Combating Terrorism: Assessing the Threat of Biological Terrorism, U.S. House of Representatives Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform. (Washington, D.C.: Policy Analyst, RAND Washington Office, 12 October 2001),

Parker, Henry S., Ph.D. Agricultural Bioterrorism: Assessing the Threat of Biological Terrorism. McNair Papers, 65. Washington, D.C.: Institute for National Strategic Studies, National Defense University, Fort Lesley J. McNair, 2002.

Pate, Jason, and Gavin Cameron. "Covert Biological Weapons Attacks against Agricultural Targets, Assessing the Impact against U.S. Agriculture." In Terrorism and Counterterrorism, Understanding the New Security Environment, ed. U.S. Army Colonel Russell C. Howard and U.S. Army Captain Reid L. Sawyer, 245-263. Guilford, Ct: McGraw-Hill Companies, 2003.

Pavlin, Julie A. "Epidemiology of Bioterrorism." Center for Disease Control: Emerging Infectious Diseases, July 1999. Publication on-line. Available from <<http://www.cdc.gov/ncidod/EID/vol5no4/pavlin.htm>>. Internet. Accessed 22 November 2002.

Public Health Security and Bioterrorism Preparedness and Response Act of 2002, PL. 107-188, (2002). Publication on-line. Available from <<http://www.ncsl.org/statefed/health/PL107-188overview.pdf>>. Internet. Accessed 25 January 2003.

Reagan, Ronald. Presidential Executive Order 12656--Assignment of Emergency Preparedness Responsibilities. Washington, D.C.: The White House, 18 November 1988. Publication on-line. Available from <<http://www.fas.org/irp/offdocs/EO12656.htm>>. Internet. Accessed 5 January 2003.

Revelle, Monica. "Progress in Blood Supply Safety." Department of Health and Human Services: Public Health Service Food and Drug Administration, May 1995. Publication on-line. Available from <http://www.pueblo.gsa.gov/cic_text/health/blood-ss/blood2.htm>. Internet. Accessed 14 December 2002.

Safonov, Georgy A. , and Vladimir A. Gavrilov. "Problems of Biological Security in Agriculture." In High-Impact Terrorism: Proceedings of a Russian-American Workshop, ed. Office for Central Europe and Eurasia Development Committee on Confronting Terrorism in Russia, Security, and Cooperation Policy and Global Affairs National Research Council; In cooperation with the Russian Academy of Sciences, 209-218. Washington, D.C.: National Academy Press, 2002. Paper on-line. Available on-line from <<http://www.nap.edu/openbook/0309082706/html/R1.html>>. Internet. Accessed 16 January 2003.

Schaffner, Donald W., and Kristin Jackson. "Why Improve Food Safety through Good Agricultural Practices (Gap's)?" The State University of New Jersey: Rutgers Cooperative Extension, 2000. Publication on-line. Available from <<http://www.rce.rutgers.edu/pubs/pdfs/fs146.pdf>>. Internet. Accessed 26 January 2003.

Seiple, Chris. "Consequence Management: Domestic Response to Weapons of Mass Destruction." PARAMETERS, US Army War College Quarterly Autumn. (1997): 119-134.

Smith, Stephen. "Us Farms Called Vulnerable to Terrorism." Boston Globe, 22 November 2002. Paper on-line. Available from <http://www.boston.com/dailyglobe2/326/nation/US_farms_called_vulnerable_to_terroris m+.shtml>. Internet. Accessed 1 December 2002.

Stafford, Robert T., Disaster Assistance and Emergency Relief Act as Amended, U.S. Code. Vol. 42, Secs. 5121-5204c, (2000). Available on-line from <<http://www.fema.gov/library/stafact.shtm>>. Internet. Accessed 24 November 2002.

Terrorism Research Center. "The Basics of Terrorism." The Terrorism Research Center, 1997. Publication on-line. Available from < <http://www.terrorism.com/terrorism/bpart1.html>>. Internet. Accessed 15 January 2003.

U.S. Census Bureau. "Resident Population of the 50 States, the District of Columbia, and Puerto Rico: April 1, 2000 (Census 2000) and April 1, 1990 (1990 Census)." Census 2000. U.S. Census Bureau, 25 January 2002. Publication on-line. Available from <<http://www.census.gov/population/cen2000/tab04.pdf>>. Internet. Accessed 11 December 2002.

- U.S. Department of Agriculture: Agricultural Research Service. Agriculture, Biological Weapons, and Terrorism. Washington, D.C.: U.S. Department of Agriculture: Agricultural Research Service, 21 April 2000.
- U.S. Department of Agriculture: Economic Research Service. "Agricultural Outlook: Statistical Indicators." No. 288. United States Department of Agriculture: Economic Research Service, Agricultural Outlook, January/February 2002. Journal on-line. Available from <<http://www.ers.usda.gov/publications/agoutlook/jan2002/ao288h.pdf>>. Internet. Accessed 11 December 2002.
- _____. "Animal Agroterrorism: Biosecurity Procedures for Emergency Responders." U.S. Department of Agriculture: Agricultural Research Service, February 2002. Project synopsis on-line. Available from <http://www.nps.ars.usda.gov/projects/projects.htm?accn_no=405411>. Internet. Accessed 26 December 2002.
- _____. "Foot-and-Mouth Disease Biosecurity in Livestock Rearing and Dairy Processing." U.S. Department of Agriculture: Agricultural Research Service, September 2001. Project synopsis on-line. Available from <http://www.nps.ars.usda.gov/projects/projects.htm?accn_no=404713>. Internet. Accessed 26 December 2002.
- _____. "Where Is Agriculture Important?" Volume 10, Number 2. United States Department of Agriculture: Economic Research Service, Rural Conditions and Trends, 2 July 2000. Journal on-line. Available from <<http://www.ers.usda.gov/publications/RCAT/rcat102/RCAT102d.pdf>>. Internet. Accessed 11 December 2002.
- U.S. Department of Energy: Energy Information Administration. "Reference Case Projections: World Energy Consumption, Gross Domestic Product, Carbon Dioxide Emissions, Nuclear Power Capacity, and
- World Population." Department of Energy: National Energy Information Center, 2 December 2002. Publication on-line. Available from <http://www.eia.doe.gov/oiaf/ieo/pdf/appa1_a8.pdf>. Internet. Accessed 26 January 2003.
- U.S. Department of Justice: Federal Bureau of Investigation. "Investigative Programs: Domestic Terrorism (DT)." FBI: Memphis Office, 1 February 2003. Paper on-line. Available from <http://memphis.fbi.gov/medt.htm>. Internet. Accessed 1 February 2003.
- U.S. General Accounting Office. Bioterrorism Federal Research and Preparedness Activities: Report to Congressional Requesters. Washington, D.C., September 2001.
- U.S. National Animal Health Emergency Management System (NAHEMS). Strategic Plan for Years 2000 through 2005. Richmond, VA: United States National Animal Health Association, August 2000. Paper on-line. Available from <<http://www.usaha.org/NAHEMS/strategy.pdf>>. Internet. Accessed 22 November 2002.

Walker, David M., Homeland Security a Framework for Addressing the Nation's Efforts, U.S. Senate Committee on Governmental Affairs. Comptroller General of the United States, U.S. General Accounting Office, 21 September 2001),

Webster's Dictionary. Webster's Ninth New Collegiate Dictionary. Ninth New Collegiate ed. Springfield, MA: Merriam-Webster, Inc., 1984.

Winslow, Frances E. "The First-Responder's Perspective." In The New Terror: Facing the Threat of Biological and Chemical Weapons, ed. Sidney D. Drell, Abraham D. Sofaer and George D. Wilson, 375-389. Stanford: Hoover Institution Press, Stanford University, 1999.

World Resources Institute. "Gross Domestic Product and Trade Values." World Resource Institute based on United Nations Population Division and World Bank, 2001. Publication on-line. Available from <http://www.wri.org/wri/wr-00-01/pdf/ei1n_2000.pdf>. Internet. Accessed 23 December 2002.